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ABSTRACT

This monograph contains an autoinstructional packet developed for secondary school biology students. The instructions present a lesson on classification using slides and packets of pictures as the media for displaying the animals and plants to be classified. A brief historical account leads into the study of the modern classification system. No prerequisites are indicated nor are there any suggestions regarding time allotment, equipment or materials, or bibliographical information. (EB)

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INTRODUCTION TO CLASSIFICATION OF LIVING THINGS

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Have you ever played the game where you were shown a picture of an object and you had to tell if it was animal, vegetable or mineral? Let's try it: Turn on the projector and put the first slide on. Record whether it is animal, vegetable or mineral. Change slides and do the same for the rest of the slides - to slide #10. Turn off the slide projector whenever you finish this or future exercises. Turn off the recorder until you are finished. Whenever you hear music, that's a signal to turn the recorder off while you are working on your exercise or even thinking of an answer to a question.(Pause)

That wasn't too hard! Turn to SLIDE #1 and we'll go over the slides. SLIDE #1 is a flower and therefore is grouped as a vegetable. SLIDE #2 is a bird and therefore an animal. SLIDE #3 is a camel - an animal, while SLIDE #4 is a tree and a vegetable. SLIDE #5 is a pair of scissors which is in the mineral group. SLIDE #6 is a butterfly and therefore an animal. SLIDE #7 is a rock and a mineral. SLIDE #8 is a cactus plant or vegetable and SLIDE #9 is an elephant and an animal. SLIDE #10 is the bird-of-paradise flower and a vegetable. To recheck your answers, you should have:

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1. vegetable
2. animal
3. animal
4. vegetable
5. mineral
6. animal
7. mineral
8. vegetable
9. animal
10. vegetable

If you got them all right, you're doing very well.

What have we just done? We have separated ten objects into three different groups. We have separated them on the basis of their make-up or composition. We have classified them. Man has classified or grouped everything in the world. He uses various methods or reasons for grouping them in a certain way. Let's see how well you can classify the objects found in the box in front of you. You may use any method or reason of grouping them together. Two rules you must follow; one, you must have more than 2 groups but less than 9 groups, and second, each object has to be in one and only one group. (Pause)

How did you group the objects? Turn on the slide projector and go to SLIDE #11. In this slide we have 5 groups based only on the color of the objects. Notice the black group only has one member. It really doesn't matter how many objects are in a group.

SLIDE #12 has them arranged by their shape. The three groups there represent objects which are round, objects which are square, and objects which are made up of lines. Some students may have

different groups.

SLIDE #13 shows classifying the objects into 6 different groups. You may have used the same basic way of classification, namely, the different uses the objects have. You may even have different objects in the same groups.

SLIDE #14 shows the classification of the objects by their make-up or composition. You may have different groups because of lack of knowledge as to what the twelve objects are made of.

You may have other ways of classifying these objects. There are no wrong answers as long as your classification system is not confusing and you follow the system correctly. A good check of your classification system is to allow another student to use your system and observe if he gets the same groups that you had. Remember, for a classification to be useful, the object must fit in one and only one group.

Let's see if you can use what you just learned to classify or group living things. In the packet of pictures in front of you are pictures of animals. See if you can classify them into three or four groups. (Pause)

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How did you group them? What reasons did you use for putting them into like groups? You could have grouped them together by the number of legs, the number of eyes, or the general appearance. Maybe you grouped them by where they live in the world. If you did, you had three groups - land, air and water.

This method was used over 2,000 years ago by the Greek philosopher, Aristotle. Aristotle's system of classification was developed around 350 B.C. and was in use until the 17th century. The way Aristotle classified plants was to have three groups - herbs, shrubs, and trees. What's wrong with Aristotle's system of classification? I hope you saw that one animal such as the duck could fit into all three groups - land, air, and water. The frog would be in the water and land groups and the insect, the air and land groups. A tree, when it is young, would be classified as a shrub or even a herb and as it grew older, it would be classified as a tree. I think you can name other examples of plants or animals that fit into more than one group. As you can see, Aristotle's system of classification was very poor.

In the Middle Ages, scholars named or classified animals and plants by describing the organisms in Latin. Latin was the language of scholars - all people who were educated studied Latin.

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Textbooks were written in Latin, regardless of what the student's native language was. Naming organisms this way was undesirable because in describing an animal or plant, its name would often be a paragraph or more in length.

By the late 17th century, scholars had named thousands of plants and animals but did not attempt to put them into groups. An Englishman, John Ray, attempted to classify organisms into groups. His system of classification was unsuccessful, however he made a great contribution to classification. He first used the term species to describe organisms having common ancestry.

In the mid 18th century, a Swedish scientist named Carl von Linne devised the basis of classification that is used today. He used Latin for naming animals and even Latinized his name to Linnaeus, by which he is know today. His system of classification was incorrect, however what it was based on - namely, grouping the organism on like structures together, is used today. He also gave each organism a Latin name made up of two words that is called its scientific name. For these reasons Linnaeus is called the Father of classification.

Before going into the modern classification system, let's review

what we have learned so far. See if you know the answers to the following questions. If you get more than two wrong answers you should go back to the beginning and listen to the tape again. I'll ask a question, pause while you're thinking of your answer, and then I'll give the answer. You may turn off the tape while you are trying to think of your answer.

Are you ready? Let's begin. Question #1. The process of grouping things together is called?....The answer is classification. Question #2. One important rule when grouping objects together is that an object must fit in how many groups?....The answer is one and only one group. Question #3. Who is the Father of modern day classification?....The answer is Linnaeus. Question #4. What scientist gave us the term, species?....The answer is John Ray. Question #5. What was wrong with Aristotle's system of classification?....The answer is his system allowed some animals or plants to be in more than one group. Question #6. What language was used by John Ray and Linnaeus in naming their organisms?....The answer is Latin. Question #7. What did Linnaeus use to divide the organisms into groups?....The answer is their body structures. Question #8. How were animals named in the Middle Ages before Ray?....The answer is they were described in Latin which proved to be extremely long. - and the last

question. How did Linnaeus name each organism?...The answer is he used a two word Latin name.

Congratulations! The quiz wasn't hard. Let's finish classification by discussing how the modern classification system works. As I said before organisms are grouped on the basis of their structures. Animals in the same groups have similar structure. That's the reason why a whale is in the same group as a deer rather than in a group with fish. A whale has mammary glands, hair on the body and is warm blooded, just like the deer, while a fish does not have any of these structures.

Let's see how well you understand this idea. Here are three animals - we'll call them animals A, B, and C. Animal A is long and pencil shaped with no legs. It has eyes, internal skeleton and smooth dry skin covered with scales. Animal B is long and pencil shaped and it too does not have any legs. It does not have eyes. It has no skeleton and it has smooth moist skin. Animal C has 4 legs and a hard shell. It has an internal skeleton, eyes, and dry scaly skin. What two animals should be in the same group? Did you say A and C? Let's look at the structures of the animals. Even though A and B both have the same basic appearance,

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A is more like C because of the similarities of their structure. A and C both have internal skeletons, eyes and dry scaly skin. You probably guessed that animal A is a snake, animal B is an earthworm and animal C is a turtle.

In scientific classification of organisms, there are seven main groups. Turn on the projector and go to SLIDE #15. In talks about them, that slide reads, kingdom, phylum, class, order, family, genus, species. These are the seven main groups in order. There are fewer and fewer organisms that are in each group as you go from kingdom to species. That's because as you go down the list each group has more specific structures until, in the last group, species, there is only one type of organism - such as the Northern water snake, Monarch butterfly, Eastern blue bird and Northern leopard frog. Notice these are very specific, not just snakes, butterflies, birds and frogs.

An easy way to remember the groups in order is to associate a sentence with the first letters of each word. Turn to SLIDE #16. There you see the first letters of each group. SLIDE #17 shows what sentence we will use to remember the groups. Study the slide until you have committed to memory - King Phillip Crossed Over Four Great Seas. After you have learned the sentence, go back to

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SLIDE #15 to associate the learned word with the correct group. You should know King is kingdom, Phillip is phylum, Crossed is Class, etc. Study it until you feel confident that you know them. Turn to SLIDE #16 to practice your association and finally see if you can write the scientific groups in order without looking at anything. When you have accomplished that, turn on the recorder. (Pause)

Now that you know the groupings, let's start discussing the first group, the kingdom. In the early 1900's there were only two kingdoms; plants and animals. Scientists grouped plants as organisms that made their own food in structures called chloroplasts, were not capable of self-movement and had a rigid cell wall as an outer boundary. The animal kingdom took its food from its environment, had self-movement and had a flexible cell membrane for its outer shell.

The problem with this classification is that some organisms could fit into both groups. For years scientists had argued whether the organism was more a plant than an animal or vice versa. One of the organisms that created this problem is the one-celled Euglena. It contains chloroplasts and can make its own food, making it a plant. However, it can move about under its own power. It has a cell membrane and when it's in dark places, it can take in

nutrients from its environment. Every few years the Euglena would be in a different kingdom. Finally scientists solved the problem. They created a third kingdom - the Protiat kingdom. This kingdom contains simple microscopic animals whose cells are distinctly different from those of the more developed members of the plant and animal kingdoms.

This new classification is still not perfect. There are other problems involved with this classification, however, they will not be discussed now. You should realize the new system is not perfect, but it is better than the old one.

The phylum is the next group. It is an important group because this is the group most commonly studied. When you study plants and animals, you usually study them by phyla. It would be too much to try and give the structural similarities of all the phyla. Instead, I have slides that contain examples of the major phyla. Turn the slide projector on and go to SLIDE #18. Study the slides and see if you can see the similar structure within the phylum. Go through the slides studying the similarities. Stop at SLIDE #25. (Pause)

The scientific name of an organism is its Latinized name. In the classification system it is the genus and species group. In writing the scientific name, there are three rules to follow.

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The genus name must be capitalized. The species name must not be capitalized and both names must be underlined. Turn on the projector and look at SLIDE #26. The name is Rana pipens and it is the Leopard Frog. Notice all three rules are being followed. SLIDE #27 has the bullfrog's scientific name Rana catesbiana. Notice the Leopard frog and the bullfrog are closely related. They are in the same Genus - Rana but in different species. This means they have the same common ancestry. but have changed enough so they are different species. Animals or plants in the same species can inter-breed and produce fertile young (young capable of producing young when matured). Animals in different species can not produce fertile young.

Let's classify man using every group. Turn to SLIDE #28. The kingdom man is in the animal kingdom. He's found in the phylum Chordata, the class Mammalia, the order Primates, the family Hominidae, the genus Homo and the species sapiens. What is man's scientific name?....Homo sapien.

One more example should be sufficient to give you enough practice using the system. We'll classify a dog. Turn to SLIDE #29. The kingdom of the dog is the animal kingdom. It's found in the Chordata phylum, class Mammalia, order Carnivora, family Canidae,

genus Canis and species familiaris.

Using one of the reference books found in the carrel, classify an earthworm, a sunflower and a cat. After you have finished it and handed it in to the teacher, you should be ready for a quiz on classification. Your teacher has this and he will discuss the grading procedure with you.